

opposite conductivity types and meeting each other to form a p-n junction, the plate electrode being at a plate-to-body voltage relative to the body electrode, the gate electrode being at a gate-to-body voltage relative to the body electrode, an inversion layer occurring in the body region along the gate dielectric layer below the gate electrode, the inversion layer comprising multiple variably appearing inversion portions respectively characterized by corresponding different zero-point threshold voltages of like sign, each inversion portion largely appearing/disappearing when the gate-to-body voltage passes through the corresponding zero-point threshold voltage with the plate-to-body voltage at zero, each inversion portion meeting the plate region or/and being continuous with another inversion portion whose zero-point threshold voltage is of lower magnitude than the zero-point threshold voltage of that inversion portion; and

further electronic circuitry having a capacitance signal path for receiving the varactor to enable the further circuitry to perform an electronic function dependent on the varactor, the plate and body electrodes being situated in the capacitance signal path.

2. (Original) A structure as in Claim 1 wherein the inversion portions comprise at least two inversion portions which, when present, meet the plate region.
3. (Original) A structure as in Claim 2 wherein the inversion portions comprise a first inversion portion and a second inversion portion whose zero-point threshold voltage is of greater magnitude than the zero-point threshold voltage of the first inversion portion, the first inversion portion extending between the second inversion portion and the plate region when both of the first and second inversion portions are present such that the second inversion portion is spaced apart from the plate region.
4. (Original) A structure as in Claim 3 wherein the inversion portions include a third inversion portion whose zero-point threshold voltage is of greater magnitude than the zero-point threshold voltage of the other two inversion portions, the second inversion portion extending between the first inversion portion and the third inversion portion when the first, second, and third inversion portions are present such that the third inversion portion is also spaced apart from the plate region.

5. (Original) A structure as in Claim 3 wherein the inversion portions include a third inversion portion that meets the plate region.
6. (Previously amended) A structure as in Claim 1 wherein the gate dielectric layer comprises multiple gate dielectric portions of different respective thicknesses, each gate dielectric portion situated above at least where a different corresponding one of the inversion portions occurs.
7. (Original) A structure as in Claim 6 wherein each gate dielectric portion extends to a location above the plate region or/and is continuous with a gate dielectric portion thinner than that gate dielectric portion.
8. (Original) A structure as in Claim 7 wherein the gate dielectric portions comprise a first gate dielectric portion and a second gate dielectric portion thicker than the first gate dielectric portion, the first gate dielectric portion extending between the second gate dielectric portion and a location above the plate region such that the second gate dielectric portion is spaced laterally apart from the plate region.
9. (Previously amended) A structure as in Claim 7 wherein each of at least two of the gate dielectric portions extends to a location above the plate region.
10. (Original) A structure as in Claim 1 wherein a surface depletion region of the body region extends along the gate dielectric layer below the gate electrode, the surface depletion region comprising multiple surface depletion portions of different respective average net dopant concentrations, each surface depletion portion situated below where a different corresponding one of the inversion portions occurs.
11. (Original) A structure as in Claim 10 wherein each surface depletion portion meets the plate region or/and is continuous with a surface depletion portion more lightly doped than that surface depletion portion.
12. (Original) A structure as in Claim 11 wherein the surface depletion portions comprise a first surface depletion portion and a second surface depletion portion more

heavily doped than the first surface depletion portion, the first surface depletion portion extending between the second surface depletion portion and the plate region such that the second surface depletion portion is spaced apart from the plate region.

13. (Previously amended) A structure as in Claim 1 wherein the gate electrode comprises multiple gate electrode portions of doped semiconductor material, each gate electrode portion situated above at least where a different corresponding one of the inversion portions occurs, each gate electrode portion being of a different conductivity type or/and a different average net dopant concentration than each other gate electrode portion.

14. (Original) A structure as in Claim 13 wherein the gate electrode portions comprise first and second gate electrode portions of the same conductivity type and different average net dopant concentrations.

15. (Previously amended) A structure as in Claim 14 wherein the first and second gate electrode portions are of opposite conductivity type to the body region, the first gate electrode portion being more heavily doped than the second gate electrode portion and extending between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

16. (Previously amended) A structure as in Claim 14 wherein the first and second gate electrode portions are of the same conductivity type as the body region, the first gate electrode portion being more lightly doped than the second gate electrode portion and extending between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

17. (Original) A structure as in Claim 13 wherein the gate electrode portions comprise (a) a first gate electrode portion of opposite conductivity type to the body region and (b) a second gate electrode portion of the same conductivity type as the body region.

18. (Original) A structure as in Claim 17 wherein the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

19. (Original) A structure as in Claim 17 wherein the gate electrode includes a metal-containing layer for electrically shorting the first and second gate electrode portions to each other.

20. (Previously amended) A structure as in Claim 13 wherein the doped semiconductor material of the gate electrode portions comprises doped non-monocrystalline semiconductor material.

21. (Previously amended) A structure as in Claim 20 wherein the doped non-monocrystalline semiconductor material comprises doped polycrystalline semiconductor material.

22. (Previously amended) A structure as in Claim 1 wherein:

the gate dielectric layer comprises a first gate dielectric portion and a second gate dielectric portion thicker than the first gate dielectric portion, each gate dielectric portion situated above at least where a different corresponding one of the inversion portions occurs; and

the gate electrode comprises (a) a first gate electrode portion of doped semiconductor material of opposite conductivity type to the body region and (b) a second gate electrode portion of doped semiconductor material of the same conductivity type as the body region, the first gate electrode portion overlying the first and second gate dielectric portions, the second gate electrode portion situated above at least where a further corresponding one of the inversion portions occurs.

23. (Original) A structure as in Claim 22 wherein:

the first gate dielectric portion extends between the second gate dielectric portion and a location above the plate region such that the second gate dielectric portion is spaced laterally apart from the plate region; and

the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

24. (Original) A structure as in Claim 22 wherein the gate dielectric layer includes a third gate dielectric portion of approximately the same thickness as the first gate dielectric portion, the second gate electrode portion overlying the third gate dielectric portion.
25. (Original) A structure as in Claim 22 wherein the gate electrode includes a metal-containing layer for electrically shorting the first and second gate electrode portions to each other.
26. (Previously amended) A structure as in Claim 22 wherein the doped semiconductor material of the gate electrode portions comprises doped non-monocrystalline semiconductor material.
27. (Previously amended) A structure as in Claim 26 wherein the doped non-monocrystalline semiconductor material comprises doped polycrystalline semiconductor material.
28. (Original) A structure as in Claim 1 wherein the gate electrode comprises multiple gate electrode portions of metal, each gate electrode portion situated above at least where a different corresponding one of the inversion portions occurs, each gate electrode portion being of a different work function than each other gate electrode portion.
29. (Original) A structure as in Claim 1 wherein the further circuitry comprises at least one additional region of the semiconductor body.
30. (Original) A structure as in Claim 1 wherein the further circuitry comprises an inductor.
31. (Original) A structure as in Claim 1 wherein:
a surface depletion region of the body region extends along the gate dielectric layer below the gate electrode; and
a body contact portion of the body region is contacted by the body electrode, is spaced apart from the surface depletion region, and is more heavily doped than the surface depletion region.

32. (Original) A structure as in Claim 1 wherein the further circuitry maintains the gate-to-body voltage approximately constant as the plate-to-body voltage is varied.

33. (Original) A structure as in Claim 1 wherein:

the varactor has a capacitance as measured between the plate and body electrodes;

and

the structure includes an input circuit responsive to an input signal for generating the plate-to-body voltage such that the varactor's capacitance varies approximately linearly with the input signal.

34. (Original) A structure comprising:

a varactor comprising (a) a plate region and a body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a gate dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode situated over the gate dielectric layer at least where the gate dielectric layer contacts material of the body region, the plate and body regions being of opposite conductivity types and meeting each other to form a p-n junction, the gate dielectric layer comprising multiple gate dielectric portions of different respective thicknesses, each gate dielectric portion extending to a location above the plate region or/and being continuous with a gate dielectric portion thinner than that gate dielectric portion; and

further electronic circuitry having a capacitance signal path for receiving the varactor to enable the further circuitry to perform an electronic function dependent on the varactor, the plate and body electrodes being situated in the capacitance signal path.

35. (Original) A structure as in Claim 34 wherein the gate dielectric portions comprise a first gate dielectric portion and a second gate dielectric portion thicker than the first gate dielectric portion, the first gate dielectric portion extending between the second gate dielectric portion and a location above the plate region such that the second gate dielectric portion is spaced laterally apart from the plate region.

36. (Previously amended) A structure as in Claim 35 wherein the gate dielectric portions include a third gate dielectric portion that extends to a location above the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

37. (Original) A structure as in Claim 34 wherein each of at least two of the gate dielectric portions extend to a location above the plate region.

38. (Original) A structure as in Claim 34 wherein:

a surface depletion region of the body region extends along the gate dielectric layer below the gate electrode; and

a body contact portion of the body region is contacted by the body electrode, is spaced apart from the surface depletion region, and is more heavily doped than the surface depletion region.

39. (Original) A structure comprising:

a varactor comprising (a) a plate region and body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a gate dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode situated over the gate dielectric layer at least where the gate dielectric layer contacts material of the body region, the plate and body regions being of opposite conductivity types and meeting each other to form a p-n junction, a surface depletion region of the body region extending along the gate dielectric layer below the gate electrode, the surface depletion region comprising multiple surface depletion portions of different respective average net dopant concentrations, each surface depletion portion meeting the plate region or/and being continuous with a surface depletion portion more lightly doped than that surface depletion portion; and

further electronic circuitry having a capacitance signal path for receiving the varactor to enable the further circuitry to perform an electronic function dependent on the varactor, the plate and body electrodes being situated in the capacitance signal path.

40. (Original) A structure as in Claim 39 wherein the surface depletion portions comprise a first surface depletion portion and a second surface depletion portion more heavily doped than the first surface depletion portion, the first surface depletion portion extending between the second surface depletion portion and the plate region such that the second surface depletion portion is spaced apart from the plate region.

41. (Original) A structure as in Claim 39 wherein:

a surface depletion region of the body region extends along the gate dielectric layer below the gate electrode; and

a body contact portion of the body region is contacted by the body electrode, is spaced apart from the surface depletion region, and is more heavily doped than the surface depletion region.

42. (Previously amended) A structure comprising:

a varactor comprising (a) a plate region and a body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a gate dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode situated over the gate dielectric layer at least one where the gate dielectric layer contacts material of the body region, the plate and body regions being of opposite conductivity types and meeting each other to form a p-n junction, the gate electrode comprising multiple gate electrode portions of doped semiconductor material, each gate electrode portion being of different conductivity type or/and different average net dopant concentration than each other gate electrode portion; and

further electronic circuitry having a capacitance signal path for receiving the varactor to enable the further circuitry to perform an electronic function dependent on the varactor, the plate and body electrodes being situated in the capacitance signal path.

43. (Original) A structure as in Claim 42 wherein the gate electrode portions comprise first and second gate electrode portions of the same conductivity type and different average net dopant concentrations.

44. (Original) A structure as in Claim 42 wherein the gate electrode portions comprise (a) a first gate electrode portion of opposite conductivity type to the body region and (b) a second gate electrode portion of the same conductivity type as the body region.

45. (Original) A structure as in Claim 44 wherein the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

46. (Original) A structure as in Claim 44 wherein the gate electrode includes a metal-containing layer for electrically shorting the first and second gate electrode portions to each other.

47. (Original) A structure as in Claim 42 wherein:

the gate dielectric layer comprises a first gate dielectric portion and a second gate dielectric portion thicker than the first gate dielectric portion, each gate dielectric portion situated above at least where a different corresponding one of the inversion portions occurs; and

the gate electrode portions comprise (a) a first gate electrode portion of opposite conductivity type to the body region and (b) a second gate electrode portion of the same conductivity type as the body region, the first gate electrode portion overlying the first and second gate dielectric portions, the second gate electrode portion situated above at least where a further corresponding one of the inversion portions occurs.

48. (Original) A structure as in Claim 47 wherein:

the first gate dielectric portion extends between the second gate dielectric portion and a location above the plate region such that the second gate dielectric portion is spaced laterally apart from the plate region; and

the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

49. (Original) A structure as in Claim 47 wherein the gate dielectric layer includes a third gate dielectric portion of approximately the same thickness as the first gate dielectric portion, the second gate electrode portion overlying the third gate dielectric portion.

50. (Original) A structure as in Claim 47 wherein the gate electrode includes a metal-containing layer for electrically shorting the first and second gate electrode portions to each other.

51. (Previously amended) A structure as in Claim 42 wherein the doped semiconductor material of the gate electrode comprises doped non-monocrystalline semiconductor material.

52. (Previously amended) A structure as in Claim 51 wherein the doped non-monocrystalline semiconductor material comprises doped polycrystalline semiconductor material.

53. (Previously amended) A structure comprising:

a plate region and a body region of the semiconductor body, the plate and body regions being of opposite conductivity types and meeting each other to form a p-n junction;
a gate dielectric layer situated over the semiconductor body and contacting the body region;

a gate electrode situated over the gate dielectric layer at least where the gate dielectric layer contacts material of the body region, the gate electrode comprising multiple gate electrode portions of doped semiconductor material, the gate electrode portions being electrically shorted to one another, each gate electrode portion (a) being continuous with at least one other of the gate electrode portions and (b) being of different conductivity type or/and different average net dopant concentration than each other gate electrode portion.

54. (Original) A structure as in Claim 53 wherein the gate electrode portions comprise first and second gate electrode portions of the same conductivity type and different average net dopant concentrations.

55. (Previously amended) A structure as in Claim 54 wherein the first and second gate electrode portions are of opposite conductivity type to the body region, the first gate electrode portion being more heavily doped than the second gate electrode portion and extending between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

56. (Previously amended) A structure as in Claim 54 wherein the first and second gate electrode portions are of the same conductivity type as the body region, the first gate electrode portion being more lightly doped than the second gate electrode portion and extending between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

57. (Previously amended) A structure as in Claim 53 wherein the gate electrode portions comprise (a) a first gate electrode portion of opposite conductivity type to the body region and (b) a second gate electrode portion of the same conductivity type as the body region.

58. (Original) A structure as in Claim 57 wherein the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

59. (Previously amended) A structure as in Claim 53 wherein:
the gate dielectric layer comprises a first gate dielectric portion and a second gate dielectric portion thicker than the first gate dielectric portion; and
the gate electrode portions comprise (a) a first gate electrode portion of opposite conductivity type to the body region and (b) a second gate electrode portion of the same conductivity type as the body region, the first gate electrode portion overlying the first and second gate dielectric portions.

60. (Original) A structure as in Claim 59 wherein:
the first gate dielectric portion extends between the second gate dielectric portion and a location above the plate region such that the second gate dielectric portion is spaced laterally apart from the plate region; and
the first gate electrode portion extends between the second gate electrode portion and a location above the plate region such that the second gate electrode portion is spaced laterally apart from the plate region.

61 - 68 (Canceled)

69. (Previously presented) A structure as in Claim 53 wherein the gate electrode includes a metal-containing layer for electrically shorting the first and second gate electrode portions to each other.

70. (Previously presented) A structure as in Claim 69 wherein the metal-containing layer overlies the gate electrode portions.

71. (Previously presented) A structure as in Claim 53 wherein the doped semiconductor material of the gate electrode portions comprises doped non-monocrystalline semiconductor material.

72. (Previously presented) A structure as in Claim 71 wherein the doped non-monocrystalline semiconductor material comprises doped polycrystalline semiconductor material.

73. (Previously presented) A structure as in Claim 59 wherein the gate dielectric layer includes a third gate dielectric portion, the second gate electrode portion overlying the third gate dielectric portion.

74. (Previously presented) A structure as in Claim 73 wherein the third gate dielectric portion is of approximately the same thickness as the first gate dielectric portion.

75. (New) A structure as in Claim 1 wherein:
the plate and body regions extend to a primary surface of the semiconductor body;

and

the structure further includes a field insulating region extending into the semiconductor body along the primary surface to define a semiconductor island laterally surrounded by the field insulating region and substantially fully occupied by material of the plate and body regions.

76. (New) A structure as in Claim 75 wherein the plate region is a substantially unitary region.

77. (New) A structure as in Claim 75 wherein the field insulating region substantially laterally surrounds at least one further semiconductor island occupied by material of the body region substantially up to the primary surface such that material of the body region extends continuously from each semiconductor island to each other semiconductor island.

78. (New) A structure as in Claim 75 wherein the body region substantially laterally surrounds the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779

79. (New) A structure as in Claim 34 wherein:
the plate and body regions extend to a primary surface of the semiconductor body;
and
the structure further includes a field insulating region extending into the
semiconductor body along the primary surface to define a semiconductor island laterally
surrounded by the field insulating region and substantially fully occupied by material of the
plate and body regions.
80. (New) A structure as in Claim 79 wherein the plate region is a substantially unitary
region.
81. (New) A structure as in Claim 79 wherein the field insulating region substantially
laterally surrounds at least one further semiconductor island occupied by material of the body
region substantially up to the primary surface such that material of the body region extends
continuously from each semiconductor island to each other semiconductor island.
82. (New) A structure as in Claim 79 wherein the body region substantially laterally
surrounds the plate region.
83. (New) A structure as in Claim 39 wherein:
the plate and body regions extend to a primary surface of the semiconductor body;
and
the structure further includes a field insulating region extending into the
semiconductor body along the primary surface to define a semiconductor island laterally
surrounded by the field insulating region and substantially fully occupied by material of the
plate and body regions.
84. (New) A structure as in Claim 83 wherein the plate region is a substantially unitary
region.
85. (New) A structure as in Claim 83 wherein the field insulating region substantially
laterally surrounds at least one further semiconductor island occupied by material of the body

region substantially up to the primary surface such that material of the body region extends continuously from each semiconductor island to each other semiconductor island.

86. (New) A structure as in Claim 83 wherein the body region substantially laterally surrounds the plate region.

87. (New) A structure as in Claim 42 wherein:

the plate and body regions extend to a primary surface of the semiconductor body;
and

the structure further includes a field insulating region extending into the semiconductor body along the primary surface to define a semiconductor island laterally surrounded by the field insulating region and substantially fully occupied by material of the plate and body regions.

88. (New) A structure as in Claim 87 wherein the plate region is a substantially unitary region.

89. (New) A structure as in Claim 87 wherein the field insulating region substantially laterally surrounds at least one further semiconductor island occupied by material of the body region substantially up to the primary surface such that material of the body region extends continuously from each semiconductor island to each other semiconductor island.

90. (New) A structure as in Claim 87 wherein the body region substantially laterally surrounds the plate region.

91. (New) A structure as in Claim 53 wherein:

the plate and body regions extend to a primary surface of the semiconductor body;
and

the structure further includes a field insulating region extending into the semiconductor body along the primary surface to define a semiconductor island laterally surrounded by the field insulating region and substantially fully occupied by material of the plate and body regions.

92. (New) A structure as in Claim 91 wherein the plate region is a substantially unitary region.

93. (New) A structure as in Claim 91 wherein the field insulating region substantially laterally surrounds at least one further semiconductor island occupied by material of the body region substantially up to the primary surface such that material of the body region extends continuously from each semiconductor island to each other semiconductor island.

94. (New) A structure as in Claim 91 wherein the body region substantially laterally surrounds the plate region.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779